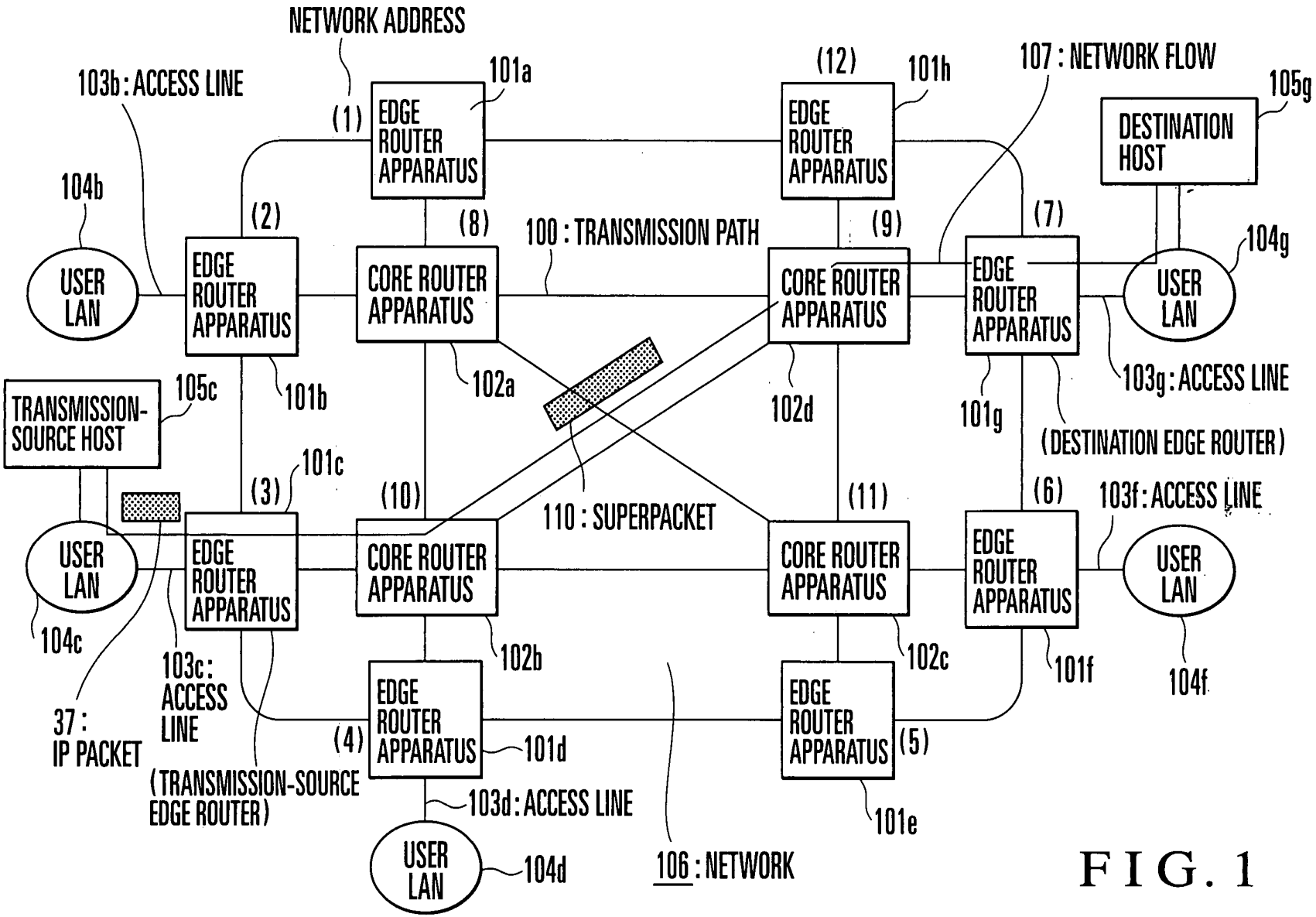

NETWORK ADDRESS
103b : ACCESS LINE
(1)
EDGE ROUTER APPARATUS
101a
(12)
EDGE ROUTER APPARATUS
101h
107 : NETWORK FLOW
DESTINATION HOST
105g
104b
(2)
(8)
100 : TRANSMISSION PATH
(9)
(7)
USER LAN
EDGE ROUTER APPARATUS
CORE ROUTER APPARATUS
CORE ROUTER APPARATUS
EDGE ROUTER APPARATUS
USER LAN
104g
TRANSMISSION-SOURCE HOST
105c
101b
102a
102d
101g
103g : ACCESS LINE
(DESTINATION EDGE ROUTER)
(3)
101c
(10)
110 : SUPERPACKET
(11)
(6)
103f : ACCESS LINE
USER LAN
EDGE ROUTER APPARATUS
CORE ROUTER APPARATUS
CORE ROUTER APPARATUS
EDGE ROUTER APPARATUS
USER LAN
104c
102b
102c
101f
104f
103c : ACCESS LINE
37 : IP PACKET
(4)
EDGE ROUTER APPARATUS
101d
EDGE ROUTER APPARATUS
(5)
(TRANSMISSION-SOURCE EDGE ROUTER)
103d : ACCESS LINE
101e
USER LAN
104d
106 : NETWORK

FIG. 1

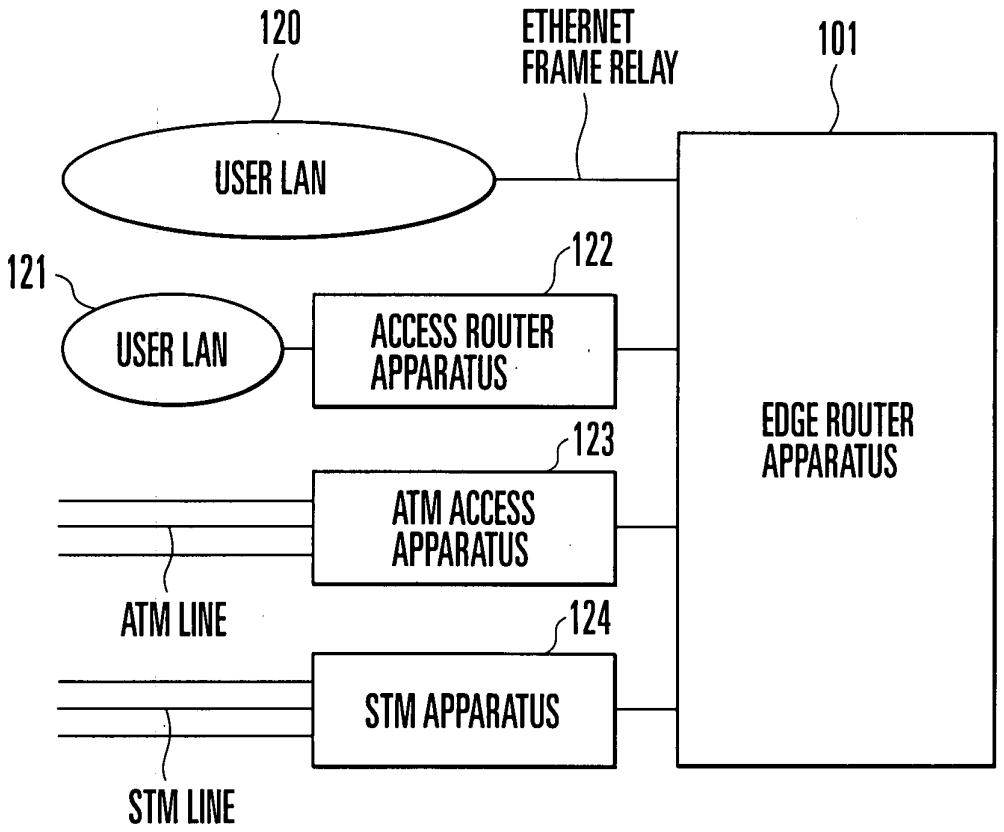
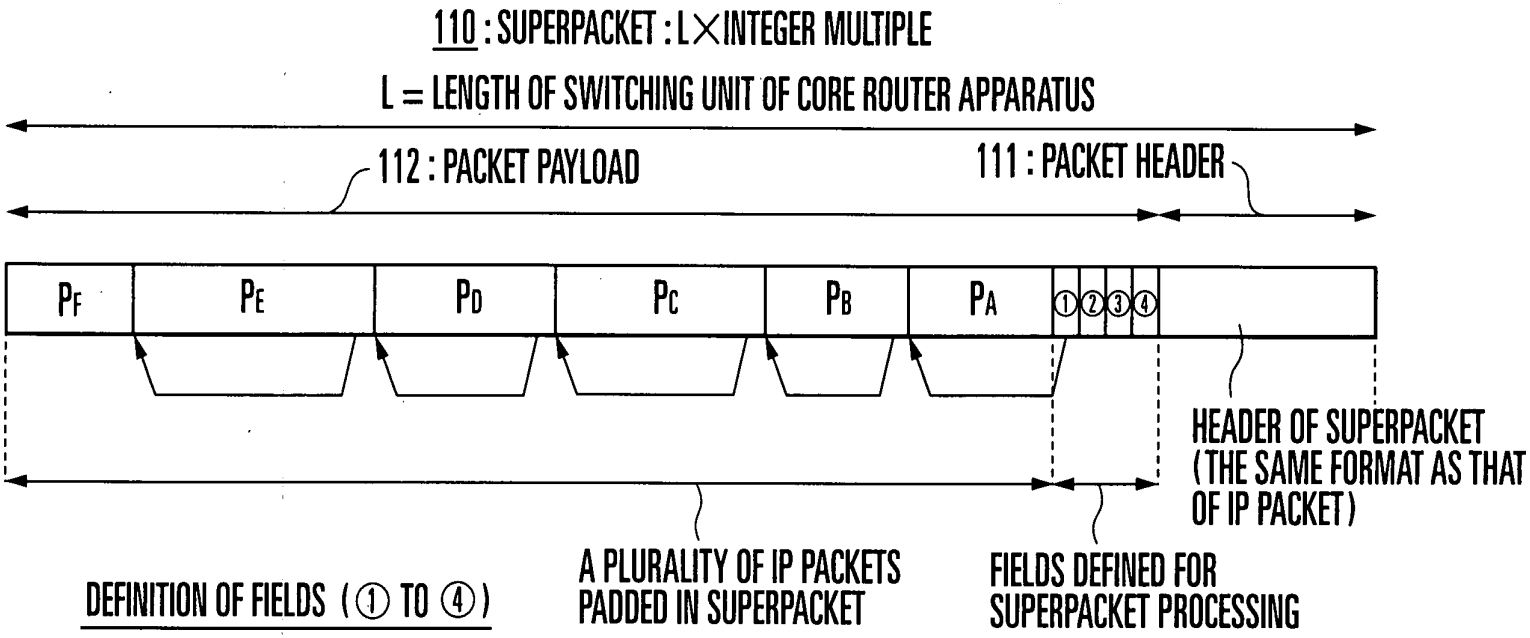

120
ETHERNET
FRAME RELAY
101
USER LAN
121
122
USER LAN
ACCESS ROUTER
APPARATUS
123
EDGE ROUTER
APPARATUS
ATM ACCESS
APPARATUS
ATM LINE
124
STM APPARATUS
STM LINE

FIG. 2



DEFINITION OF FIELDS (① TO ④)

① POINTER FIELD
POINTER INDICATING START POSITION OF FIRST IP PACKET PADDED IN SUPERPACKET

② PACKET COUNT FIELD
FIELD REPRESENTING THE NUMBER OF PACKET START POSITIONS THAT OCCUR ON SUPERPACKET

③ PADDING ON/OFF FIELD
FIELD REPRESENTING WHETHER IP PACKET AT THE END OF SUPERPACKET IS ACTUAL IP PACKET DATA OR MERELY FREE REGION FOR PADDING

④ SINGLE PACKET OCCUPATION FIELD
FIELD REPRESENTING THAT ENTIRE SUPERPACKET IS USED BY PARTIAL DATA OF SINGLE IP PACKET AND HAS NO PACKET START POSITION OR PADDING

FIG. 3

EXAMPLE OF HEADER OF SUPERPACKET (EXAMPLE FOR IPv4)

VERSION	IHL	SERVICE TYPE	TOTAL LENGTH	
IDENTIFIER (ID)			FLAG	FRAGMENT OFFSET
TIME TO LIVE (TTL)		PROTOCOL	HEADER CHECKSUM	
TRANSMISSION-SOURCE ADDRESS (DESCRIBING TRANSMISSION-SOURCE EDGE ROUTER ADDRESS)				
DESTINATION ADDRESS (DESCRIBING DESTINATION EDGE ROUTER ADDRESS)				
OPTION				PADDING

FIG. 4

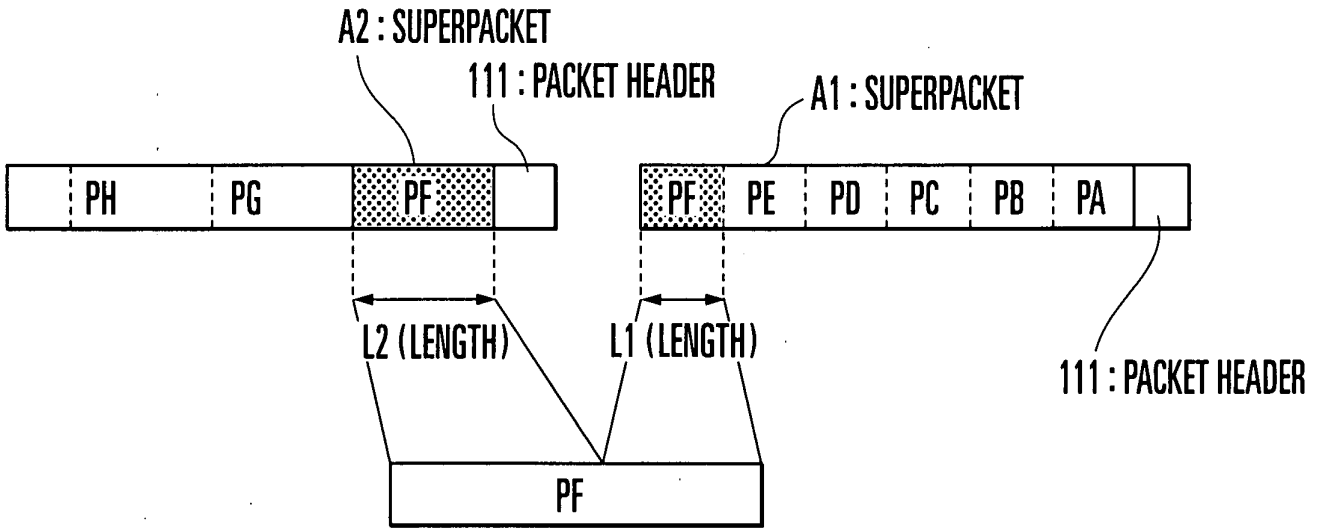

A2 : SUPERPACKET
111 : PACKET HEADER
A1 : SUPERPACKET
PH
PG
PF
PF
PE
PD
PC
PB
PA
L2 (LENGTH)
L1 (LENGTH)
111 : PACKET HEADER
PF

FIG. 5A

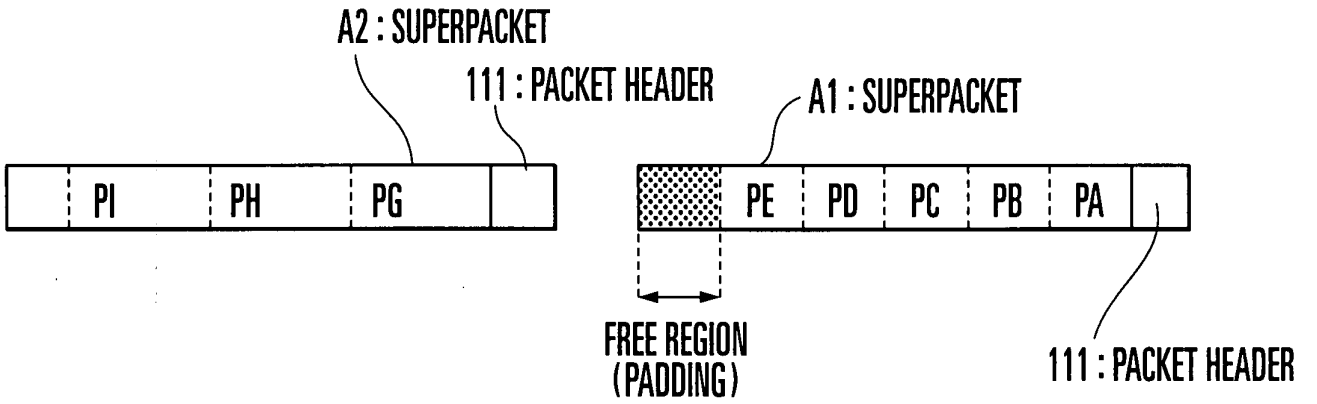

A2 : SUPERPACKET
111 : PACKET HEADER
A1 : SUPERPACKET
PI
PH
PG
PE
PD
PC
PB
PA
FREE REGION
(PADDING)
111 : PACKET HEADER

FIG. 5B

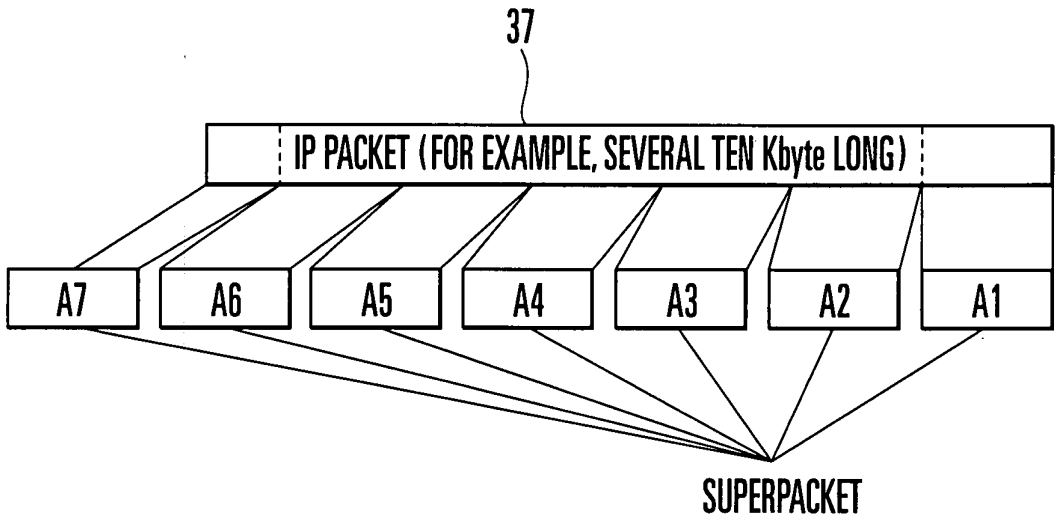

37
IP PACKET (FOR EXAMPLE, SEVERAL TEN Kbyte LONG)
A7
A6
A5
A4
A3
A2
A1
SUPERPACKET

FIG. 6

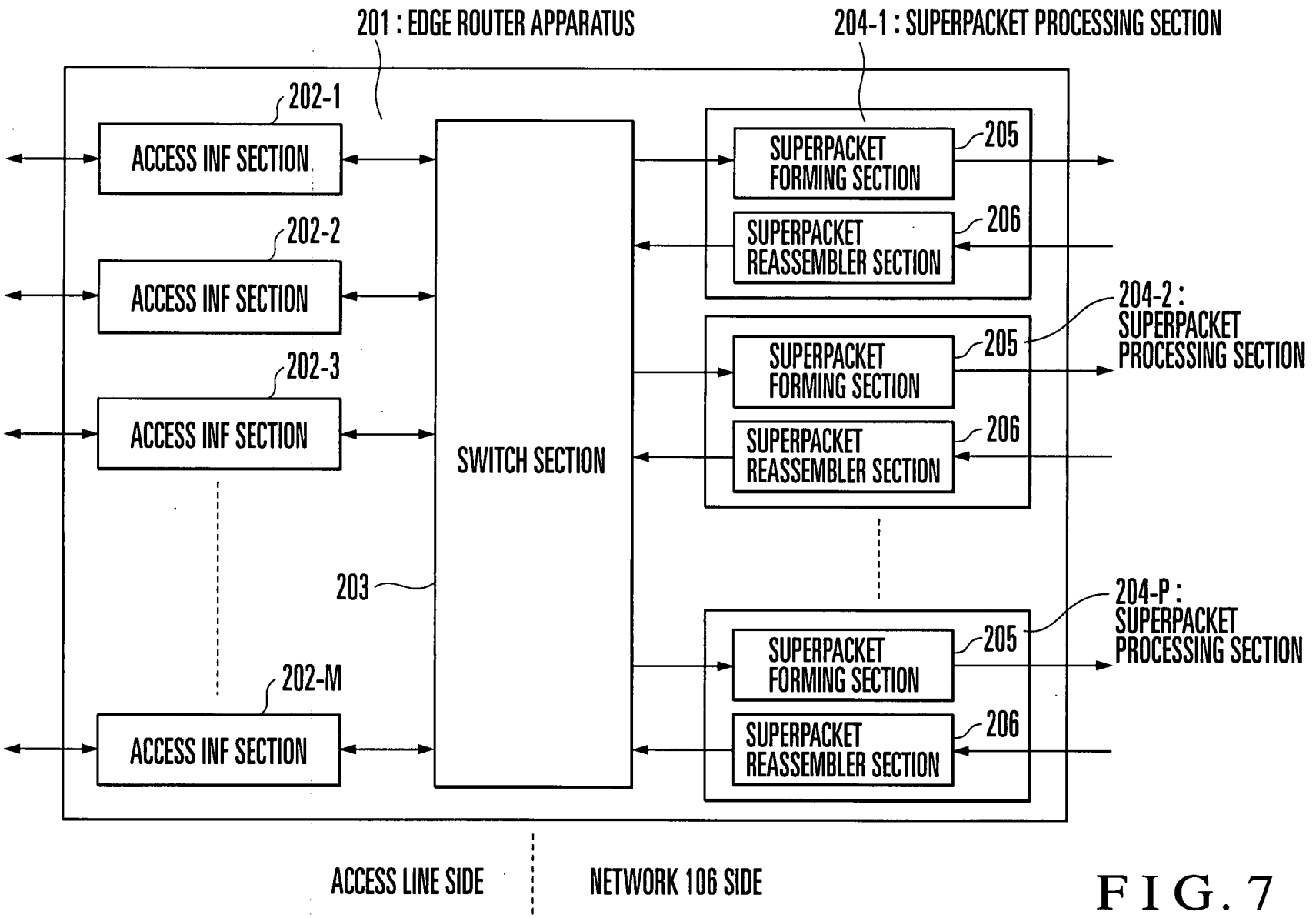

201 : EDGE ROUTER APPARATUS
204-1 : SUPERPACKET PROCESSING SECTION
202-1
ACCESS INF SECTION
202-2
ACCESS INF SECTION
202-3
ACCESS INF SECTION
202-M
ACCESS INF SECTION
203
SWITCH SECTION
SUPERPACKET FORMING SECTION
205
SUPERPACKET REASSEMBLER SECTION
206
204-2 : SUPERPACKET PROCESSING SECTION
204-P : SUPERPACKET PROCESSING SECTION
ACCESS LINE SIDE
NETWORK 106 SIDE

FIG. 7

0000501 0500560

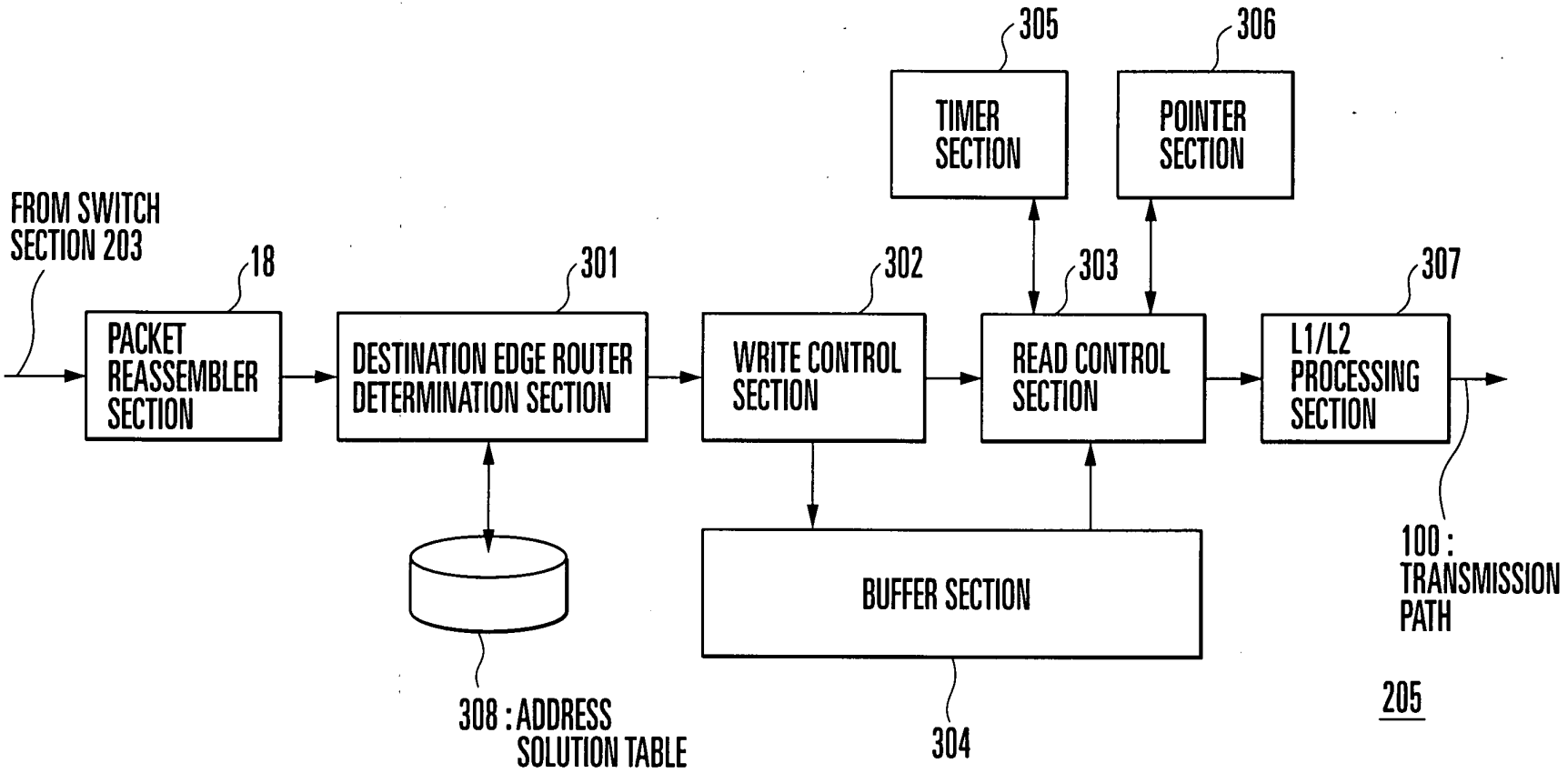


FIG. 8

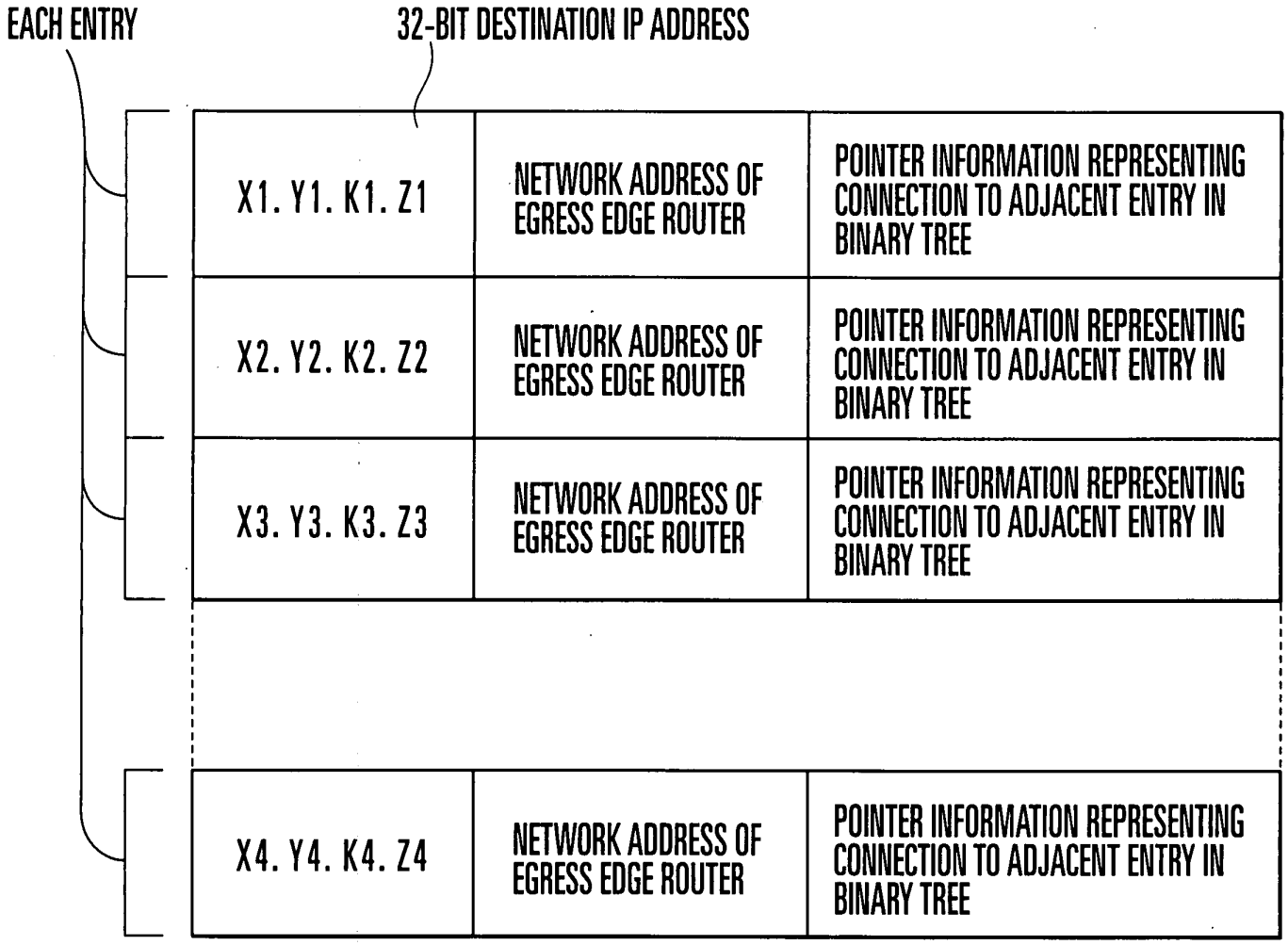

EACH ENTRY
32-BIT DESTINATION IP ADDRESS
X1. Y1. K1. Z1
NETWORK ADDRESS OF EGRESS EDGE ROUTER
POINTER INFORMATION REPRESENTING CONNECTION TO ADJACENT ENTRY IN BINARY TREE
X2. Y2. K2. Z2
NETWORK ADDRESS OF EGRESS EDGE ROUTER
POINTER INFORMATION REPRESENTING CONNECTION TO ADJACENT ENTRY IN BINARY TREE
X3. Y3. K3. Z3
NETWORK ADDRESS OF EGRESS EDGE ROUTER
POINTER INFORMATION REPRESENTING CONNECTION TO ADJACENT ENTRY IN BINARY TREE
X4. Y4. K4. Z4
NETWORK ADDRESS OF EGRESS EDGE ROUTER
POINTER INFORMATION REPRESENTING CONNECTION TO ADJACENT ENTRY IN BINARY TREE

FIG. 9

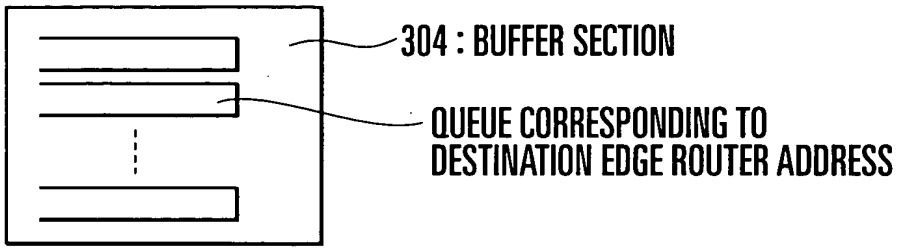


FIG. 10

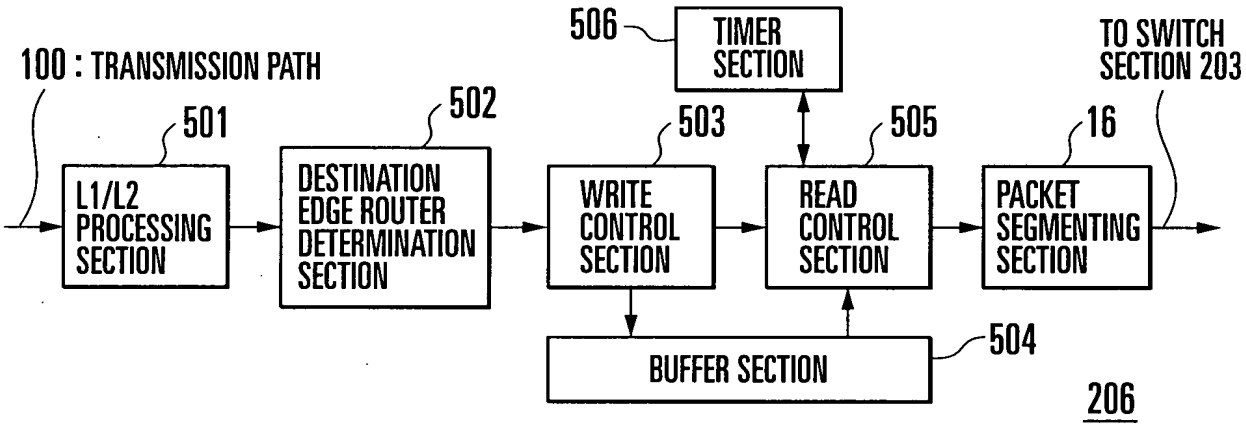


FIG. 11

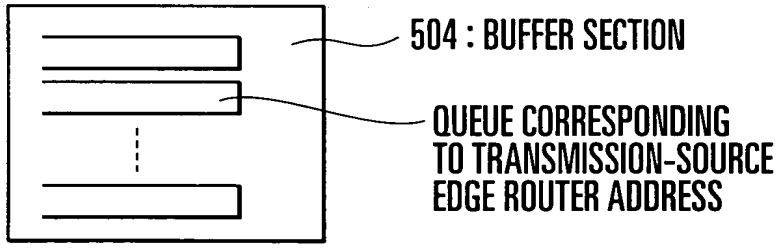


FIG. 12

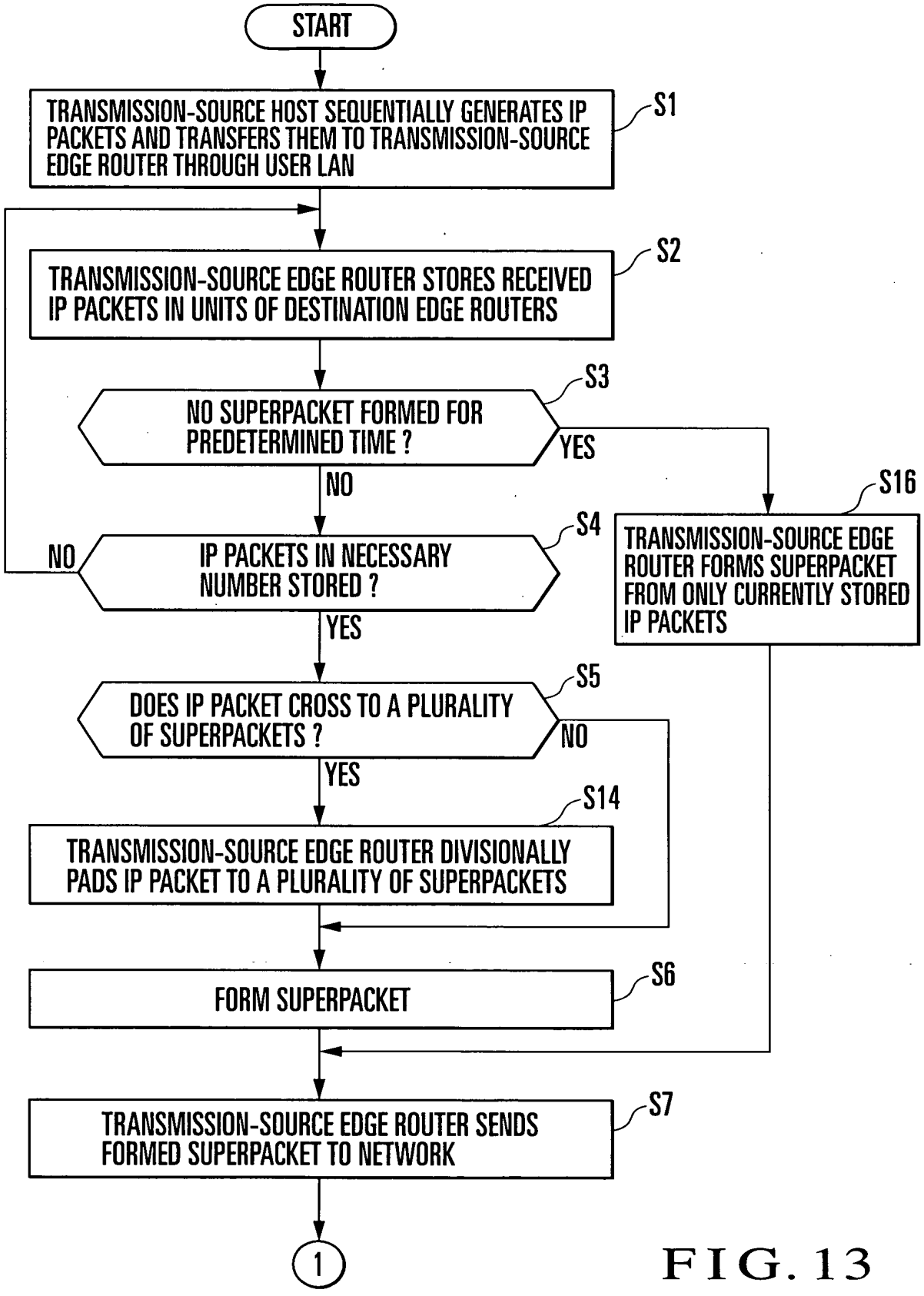

START
TRANSMISSION-SOURCE HOST SEQUENTIALLY GENERATES IP PACKETS AND TRANSFERS THEM TO TRANSMISSION-SOURCE EDGE ROUTER THROUGH USER LAN
S1
TRANSMISSION-SOURCE EDGE ROUTER STORES RECEIVED IP PACKETS IN UNITS OF DESTINATION EDGE ROUTERS
S2
NO SUPERPACKET FORMED FOR PREDETERMINED TIME ?
S3
YES
NO
IP PACKETS IN NECESSARY NUMBER STORED ?
S4
NO
YES
TRANSMISSION-SOURCE EDGE ROUTER FORMS SUPERPACKET FROM ONLY CURRENTLY STORED IP PACKETS
S16
DOES IP PACKET CROSS TO A PLURALITY OF SUPERPACKETS ?
S5
NO
YES
TRANSMISSION-SOURCE EDGE ROUTER DIVISIONALLY PADS IP PACKET TO A PLURALITY OF SUPERPACKETS
S14
FORM SUPERPACKET
S6
TRANSMISSION-SOURCE EDGE ROUTER SENDS FORMED SUPERPACKET TO NETWORK
S7
1

FIG. 13

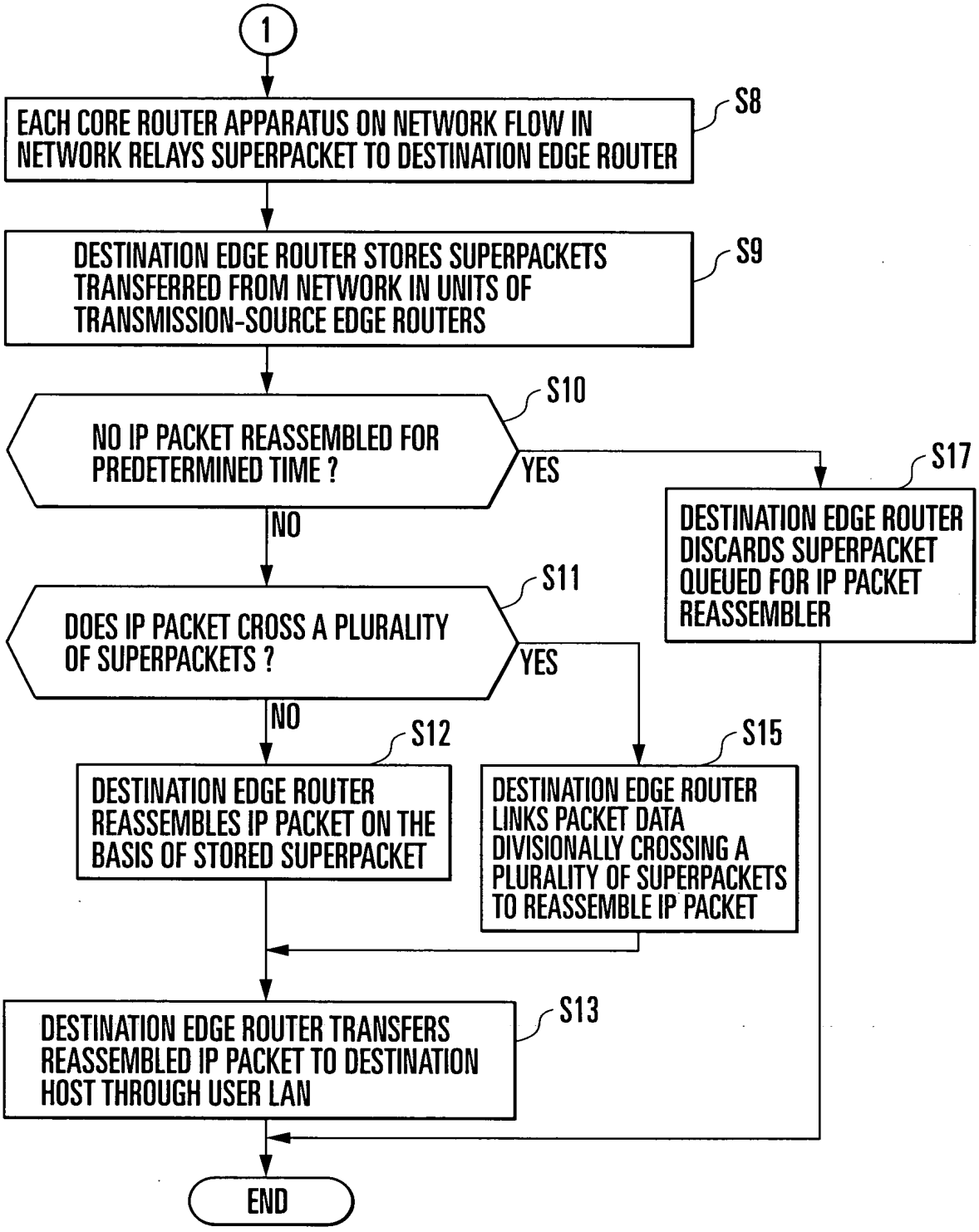

1
EACH CORE ROUTER APPARATUS ON NETWORK FLOW IN NETWORK RELAYS SUPERPACKET TO DESTINATION EDGE ROUTER
S8
DESTINATION EDGE ROUTER STORES SUPERPACKETS TRANSFERRED FROM NETWORK IN UNITS OF TRANSMISSION-SOURCE EDGE ROUTERS
S9
NO IP PACKET REASSEMBLED FOR PREDETERMINED TIME ?
S10
YES
NO
DOES IP PACKET CROSS A PLURALITY OF SUPERPACKETS ?
S11
YES
NO
DESTINATION EDGE ROUTER DISCARDS SUPERPACKET QUEUED FOR IP PACKET REASSEMBLER
S17
DESTINATION EDGE ROUTER REASSEMBLES IP PACKET ON THE BASIS OF STORED SUPERPACKET
S12
DESTINATION EDGE ROUTER LINKS PACKET DATA DIVISIONALLY CROSSING A PLURALITY OF SUPERPACKETS TO REASSEMBLE IP PACKET
S15
DESTINATION EDGE ROUTER TRANSFERS REASSEMBLED IP PACKET TO DESTINATION HOST THROUGH USER LAN
S13
END

FIG. 14

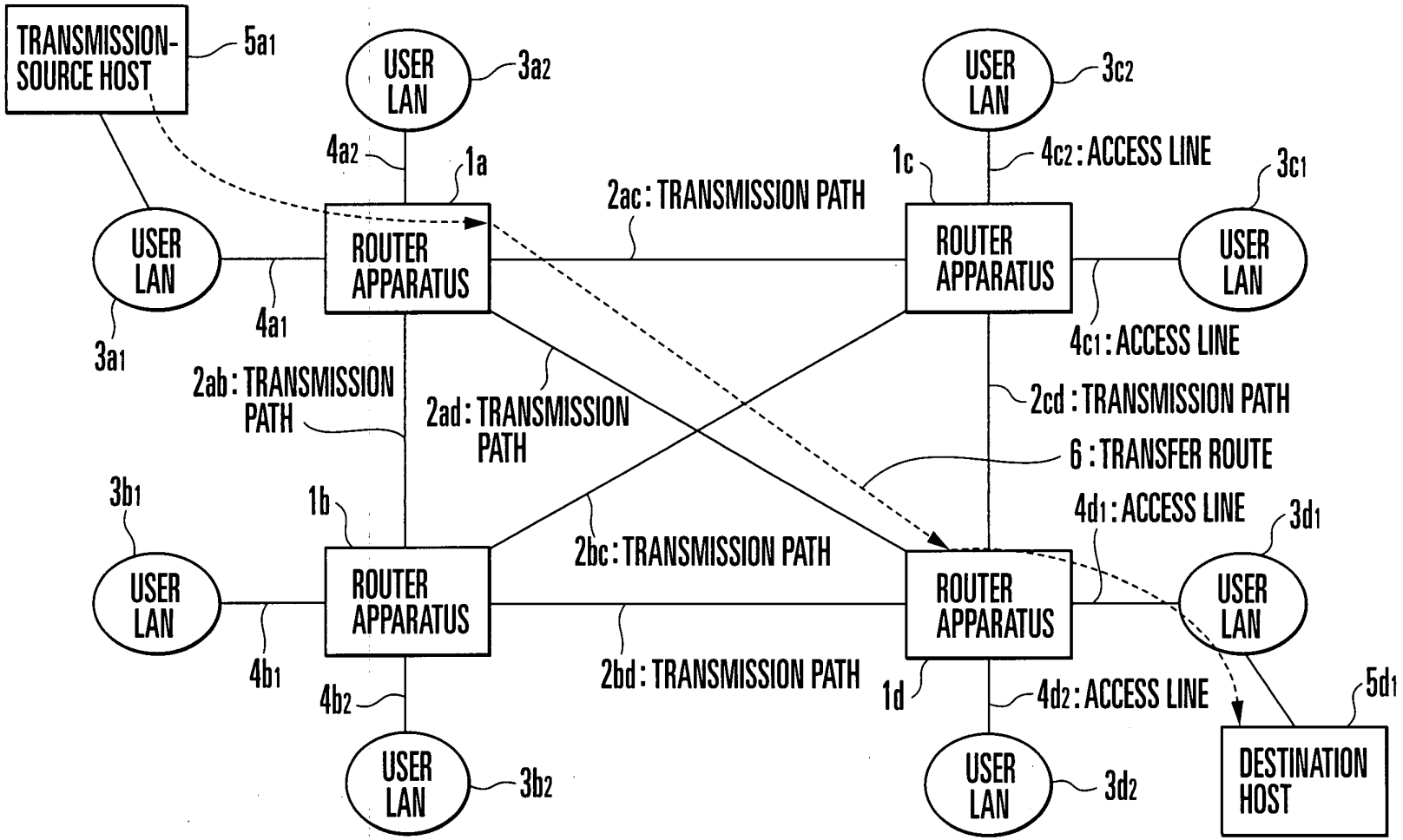


FIG. 15
PRIOR ART

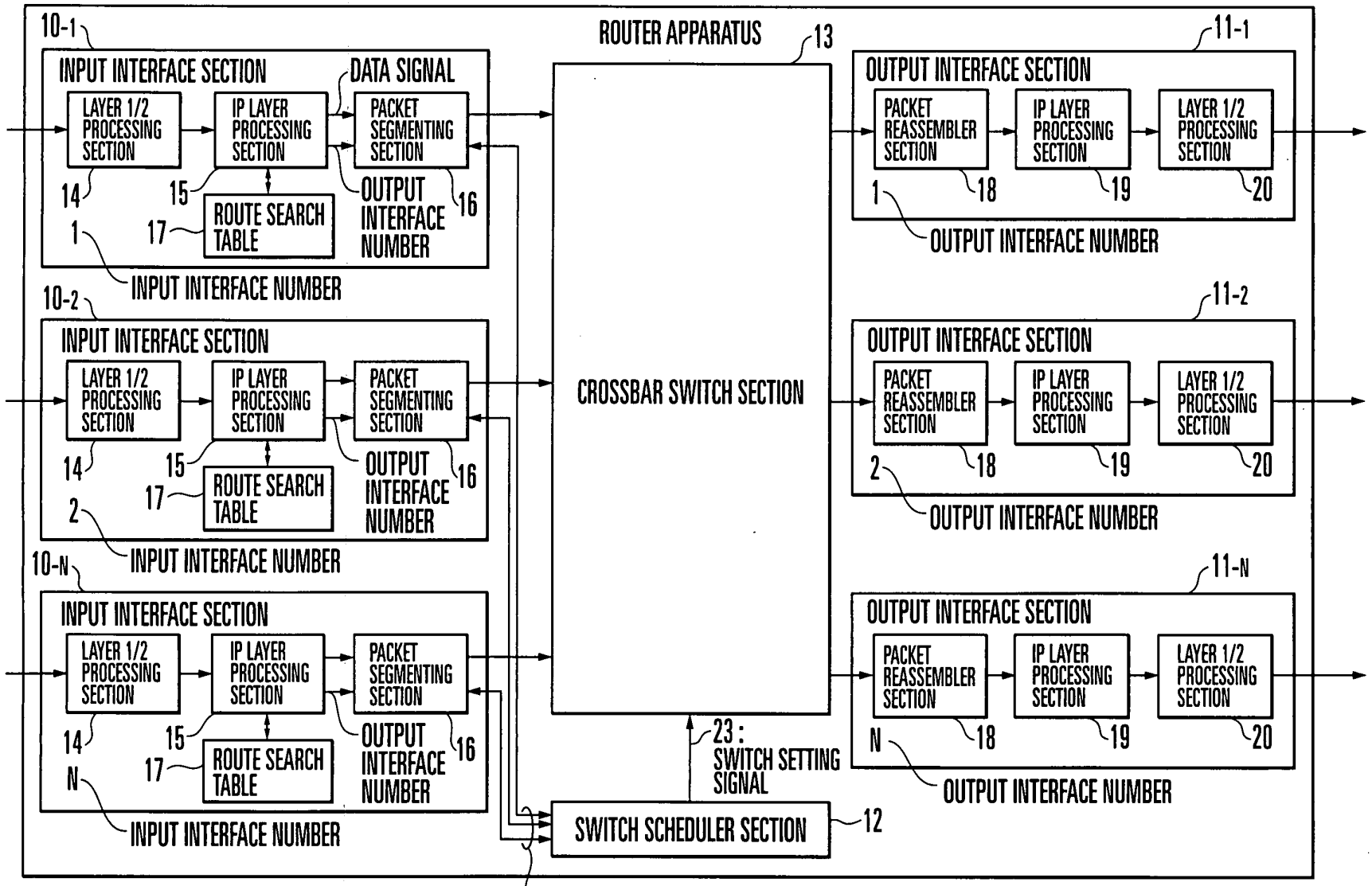


FIG. 16
PRIOR ART

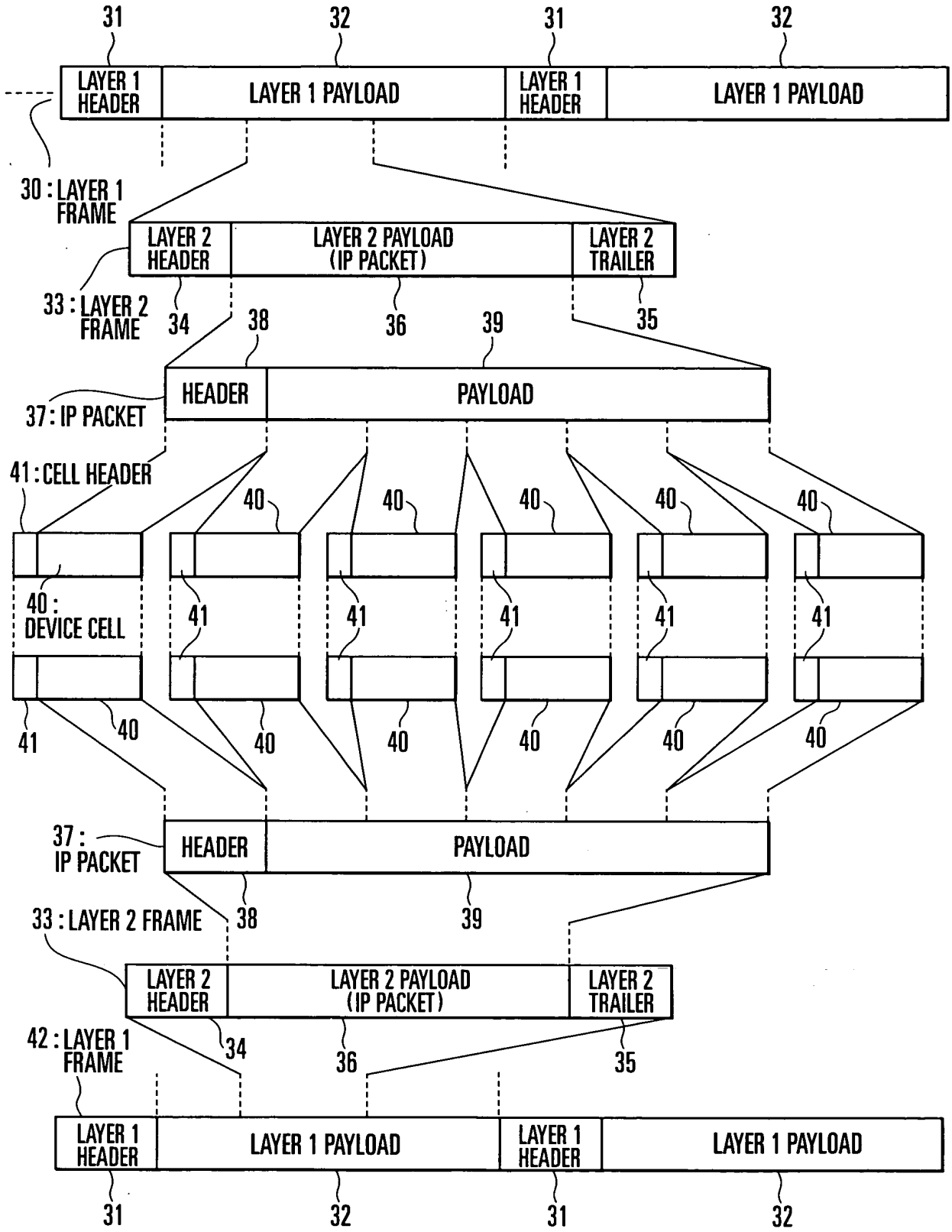


FIG. 17
PRIOR ART

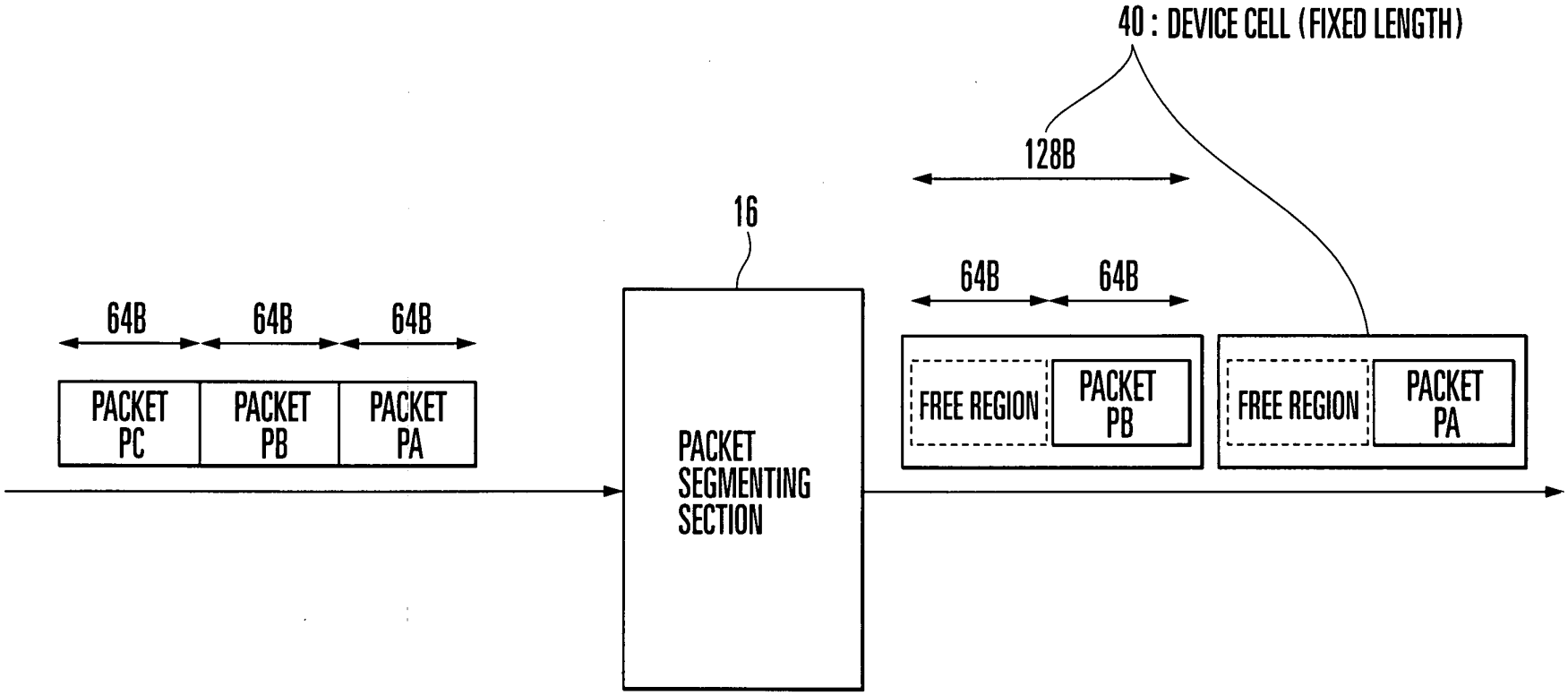


FIG. 18
PRIOR ART

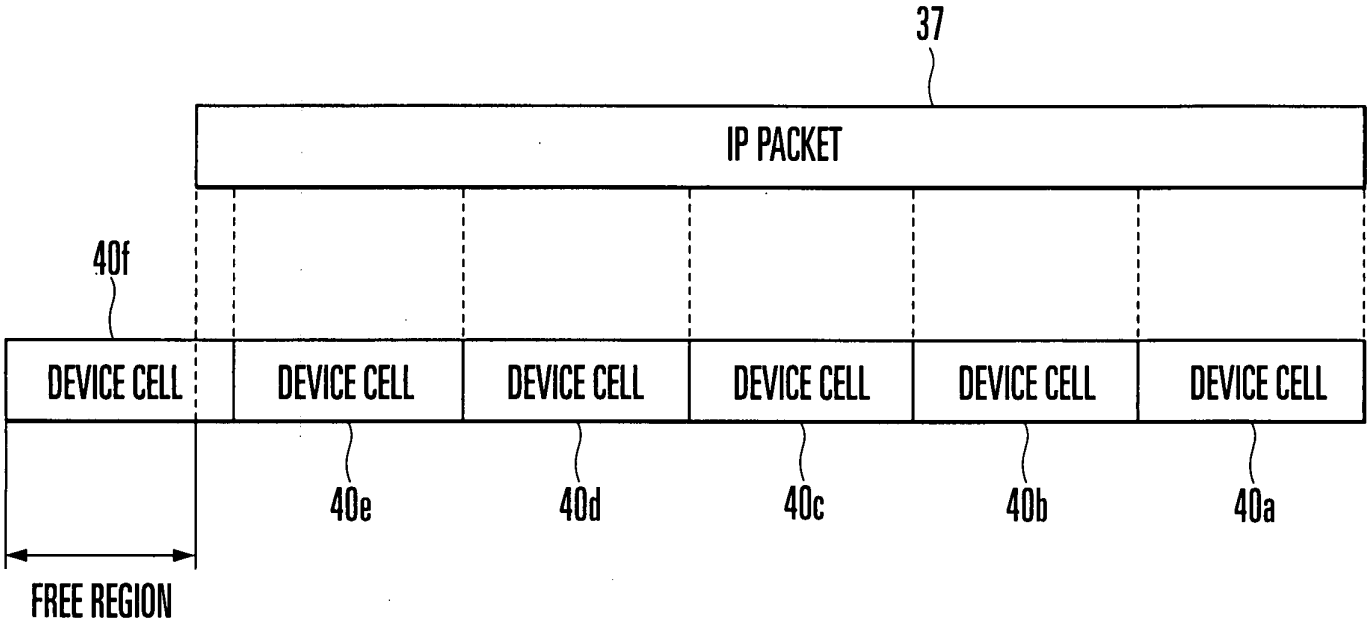


FIG. 19
PRIOR ART